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STARK ORCHARD BOOK

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STARK BRO'S
NURSERIES & ORCHARDS CO.
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NURSERIES & ORCHARDS CO.
LOUISIANA, MO., U.S.A.



Stark Orchard Book

Planting and
Care of Trees

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PUBLISHED BY
STARK BRO'S NURSERIES & ORCHARDS CO.
LOUISIANA, MO., U. S. A.

Stark Orchard Book

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Stark Orchard Book

Preface

The Stark Orchard Book is the result of a demand. Fruit growers throughout the country are asking for concise, reliable information about the planting and care of trees. In view of this fact our Special Service Department has issued this book, which aims to treat the practical side as well as the scientific. We have endeavored to treat each subject in its logical order, beginning when the trees are selected and planted, and taking up various problems that the fruit grower will meet, up to the time fruit is marketed.

Our Special Service Department includes men of wide experience — experts in orchard and nursery work. These men will gladly assist you in solving your problems. Do not hesitate to write them. Their service is free of charge. The literature issued by this Department will be forwarded upon request.

Stark Bro's Nurseries & Orchards Co. have been growing trees since 1816 — nearly a century of experience. This has resulted in a great store of horticultural knowledge, which has been handed down from father to son for four generations. We began in a small way, but our growth has been gradual and steady until Stark Bro's now have the largest and most complete nursery establishment in the world.

Growing Trees

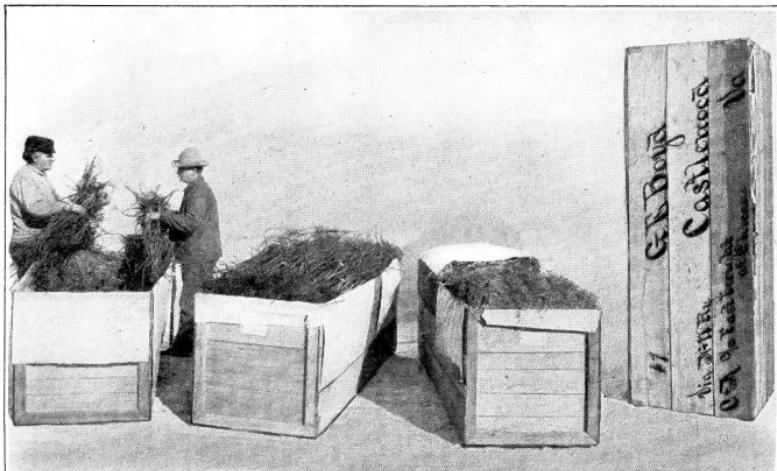
Our four generations of experience has taught us that all kinds of nursery stock cannot be grown in any one locality. Different kinds of trees require different soils and climatic conditions to grow to the highest degree of perfection. We grow all of our stock, and to do this we have eight well established branch nurseries in six different States, growing at each nursery the kinds that are best adapted to that particular soil and climate. By following this policy, we are enabled to produce the best trees that can possibly be grown by up-to-date nursery science.

Stark Propagating System

Stark Bro's are *pioneers* in propagating trees from *proven strains* of bearing trees. This method is vastly more expensive than cutting from indiscriminate trees, but the resulting trees are of much greater value and, besides, it totally eliminates all chance of trees being untrue to name.

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Stark trees are propagated *only* from whole root stocks, made from the best American and French seedlings. Trees grown in this way make long-lived, vigorous orchard trees. No matter where you buy your trees buy whole-root trees.



PACKING TREES BY THE STARK METHOD

First a layer of moist fiber, then a layer of trees and so on until box is full. The heavy paper lining protects trees from drying and freezing.

Stark Packing Method

The Stark method of packing insures the safe arrival of stock. If there were a better way to pack trees, we would pack that way, but experience has shown that the Stark method is best. We use strong, durable boxes, lined with heavy paper to prevent drying and freezing. The trees are packed in damp fiber and moss.

We annually ship large quantities of stock to foreign countries — Australia, India, New Zealand, Alaska, etc. The Stark packing method stands the test and these trees are planted with entire success.

STARK BRO'S NURSERIES & ORCHARDS CO.,
Louisiana, Missouri.

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Quality Fruit

One of the most important points to consider in planting an orchard is the selection of varieties. The apple-consuming public appreciates quality in fruit and is willing to pay for it. Consumers will not accept such poor sorts as Ben Davis, Missouri Pippin, etc., but demand high quality varieties like Stark Delicious, Stayman Winesap, Stark King David, Jonathan, etc. When Ben Davis will not pay for the picking, the quality sorts command high prices on the market. The fact that practically all new orchards are being set to these quality varieties is overwhelming proof that progressive orchardists realize the importance of selecting high quality varieties.

When to Plant

Fall planting is advisable where the winters are not extremely severe. Some of the advantages of fall planting are: *first*, it is a convenient time — generally less work on the farm and in the orchard; *second*, the tree heals the cut roots, establishes itself and is ready to start growth early in the spring, thus acquiring strength to withstand summer droughts; *third*, the buyer gets the pick of the nursery trees and does not run the risk of the supply of any of the desired varieties being exhausted.

Stock planted in the spring should be set out early. If you decide, after buying trees in fall, not to plant until spring, heel in the trees (see page 8 for directions). This, if well done, will keep them in perfect condition.

Planting season is not regulated by date or by planter's location, but by *condition of stock* to be planted. Stark Bro's method of growing, packing and shipping stock assures its arrival in proper planting condition. We annually ship thousands of trees to planters in the South weeks after their spring has opened and these trees are planted with entire success.

"It has been our experience that a fall planted tree does at least fifty per cent better the first year than one that has been planted in the spring."—C. A. McCue, Horticulturist, Del. Agr. Exp. Station.

"Over a large part of this country fall planting is practicable. The ground is usually in better condition and the wounds on the roots heal and rootlets are formed ready for growth at the first impulse of spring. If planting cannot be done in the fall for any reason get the trees and heel them in until early spring, then they will be on hand just when they are needed."—Prof. H. E. Van Deman, Ex-United States Pomologist.

"For mild climates I much prefer fall planting. Where climate is too rigorous for fall planting, I prefer to get my trees in the fall and heel them in for spring planting."—F. Walden, Editor "Ranch."

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Age of Tree

Large commercial planters have almost entirely given up planting anything but one-year trees. After conducting extensive experimental work and practical tests in our own orchards and seeing the results of experiments carried on by horticulturists and orchardists throughout the country, we were convinced long ago that the one-year tree is best; and as we grow them—one-year top, three-year-old roots—they are the ideal orchard tree.

The famous western fruit growing valleys, as well as many other orchard sections, are unanswerable arguments in favor of one-year trees. The foundations for practically all of these wonderful orchards are one-year trees, and there, an older tree can hardly be given away.

Advantages of the one-year tree:

1. Cheaper to buy — lessens planter's original investment.
2. Handled and planted at less expense than an older, bulkier tree.
3. Withstands the shock of transplanting better than an older tree.
4. Establishes itself readily and grows more thriftily.
5. The one-year tree can be pruned and trained to the exact form desired by the grower — one of the strongest arguments in its favor. In the case of an older tree, the head is formed in the nursery row.
6. A one-year tree will soon overtake and will bear *just as soon* as an older tree planted at the same time.

"I fully agree with you in regard to planting one-year trees. In answering the many inquiries received at this office, my advice is always in favor of the one-year tree, especially if well grown and on sound, healthy roots. *Fully 90% of all apple trees now planted for commercial purposes are of this age.* The low head is now almost universally preferred, and the one-year tree affords best conditions for forming such heads. The shock in transplanting is much less than in older trees."—G. B. Brackett, U. S. Pomologist.

"It is our belief here at the Station that the one-year-old tree is the better, more economical, and the safer tree to plant."—J. C. Whitten, Prof. of Horticulture, Missouri State University.

"I am very much in favor of yearling trees, but it seems difficult to get them in Ohio. There is no question but what they are the best trees to plant when well grown. The future framework of the tree may be placed exactly where the grower wishes it. With older trees this is quite impossible."—Wendell Paddock, Prof. of Horticulture, Ohio University.

"One-year-old trees could be used universally with greater success than two-year. I should certainly use one-year trees, provided I could get them of good size — say 3 to 4 feet. By using one-year-old trees, there would be great

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ONE-YEAR-OLD APPLE TREES

As grown in the Ozark country by Stark Bro's, these trees attain perfection—strong and vigorous with incomparable root systems, the ideal orchard foundation.

saving in freight charges and large numbers of trees could be handled between the station and orchard with greater ease."—W. L. Howard, Ex-Sec. State Board of Hort., and Prof. of Horticulture, Missouri State University.

"Advise every one to set one-year trees. Two years ago Stark Bro's sent me two-year trees, including, without charge, a lot of yearlings. Every yearling lived. To-day the yearling are much larger than the two-year."—Fred. L. Post, Chelan Co., Washington.

"I advocate planting one-year trees and my experience is that Stark Bro's trees have the best root system of any trees coming in here. No nurseries in irrigated valleys can compete with Missouri conditions for producing good stock."—Hon. Silas Wilson, Canyon Co., Idaho.

"One-year trees, first, last and all the time here for us—two-year about knocked out except in small lots to people who do not know reasons. The one-year, less in freight, easier to plant, can be headed to suit, grows better, etc."—C. S. Scott, Monroe Co., West Virginia.

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Arrival of Trees

As soon as the trees arrive, unpack immediately, carefully shaking out all packing; if possible, plant at once. However, if they arrive during frosty weather, place them *unopened* in a cool, dry cellar, but free from frost. When the weather moderates, unpack as above. Don't expose roots to sun, air, wind or frost.

If the trees have been miscarried or delayed in shipment and have become badly shriveled, bury them in moist earth and pour on water, keeping them wet for a few days. When the trees have become plump and fresh, plant at once.



HEELING IN TREES

One layer of trees has been covered with dirt and second layer is being placed on top. Trees are taken directly from box and heeled in — no exposure. After last layer is heeled in, cover the entire mound with soil.

Heeling In

If ground is not ready to plant when trees arrive, unpack and heel in. A good plan which many fruit growers prefer is to order stock in fall and heel in until the next spring, when the trees will be in good condition and will be on hand when you are ready to plant. When heeling in, choose fine, loose soil, in a well-drained location, preferably on a ridge. Dig a trench two feet deep, throwing dirt forward so as to make a sloping bank on which lay the trees slanting, with roots in trench. *Be sure to cut the bundles open,*

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shake out all the packing, and lay trees in thin layers. Then throw a layer of dirt on the roots and on the whole length of trees to the very tips. Work the soil in *well around the roots and tops*, packing the dirt *firmly*. Dig the trench back further, then put in another layer of trees, covering all deep with soil. Add as many layers as necessary to dispose of all the trees, with dirt between each layer. Do not be afraid of putting on too much dirt. Smooth the sides so as to turn off water and dig trenches entirely around the mound, allowing for a ditch to carry off the surface water.

Orchard Lands

Site

As a rule, rolling or gently sloping land is best for the orchard. This insures good air drainage. Avoid "pockets," because cold air, being heavier than warm air, will sink into the pockets and increase the danger of frost injury.

Soils

In general, any good farm soil is all right for fruit growing. Avoid wet spots; a good, deep, well-drained soil is preferable. The various fruits show a preference for certain types, although they will thrive on widely varied soils. For instance, the apple will succeed on a light, sandy loam, but it will also produce excellent crops on heavy clay soils. But as a rule, apple does best on a medium soil — neither too light nor too heavy.

Humus is one of the most important constituents of soils. It dissolves the mineral plant foods and makes them available to the plant roots and also increases water-holding capacity of the soil. Humus consists of decayed organic matter, such as rotted leaves, manure, plowed under cover crops, etc., and it contains important plant foods. The maintenance of the humus supply in soils is absolutely necessary if profitable crops are grown. (See page 26 under Cover Crops for best method of maintaining humus supply.)

The three general classes of soils are: 1, Light (Sandy) soils; 2, Medium (Loamy) soils; and 3, Heavy (Clay) soils.

The management of *sandy* soils is largely a matter of maintaining the humus content. These soils are liable to get "burnt out," but this can be prevented or remedied by plowing under cover crops or stable manure. A sandy soil usually produces fruit of higher color. These soils dry out very quickly, thus allowing cultivation soon after rains and very early in the spring.

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Loamy soils as a rule are best adapted for growing all kinds of fruits. They are the easiest to handle and keep fertile. Generally they have sufficient of the necessary mineral elements, hence rarely require commercial fertilizers. On rich soils the wood growth of the trees is liable to continue late into the fall, therefore cultivation should be stopped soon enough to allow the wood to mature before severe weather.

Clay soils are the most difficult to handle. They must be plowed and cultivated at just the right time. If plowed too wet they are liable to "puddle," forming big clots; if allowed to get too dry they will bake. Maintaining a sufficient amount of humus, by the use of cover crops and manure, in connection with frequent cultivations, is the key to the successful operation of clay soils.

When soils bake a large amount of soil moisture is lost by evaporation, therefore the crust should be broken *very soon after each rain*. Try to maintain a fine dust mulch about three or four inches deep, by constant cultivation. This method of management will conserve the moisture. Plow deeply and harrow thoroughly. *Frequent cultivation is the secret of moisture conservation.* (See page 25 for details of cultivation.)

Drainage

Low, wet land is not adapted to fruit growing. Provide sufficient surface drainage to carry off excess water. Tile drains are often desirable and will greatly benefit the orchard and especially heavy, wet, clay soils.

Planting

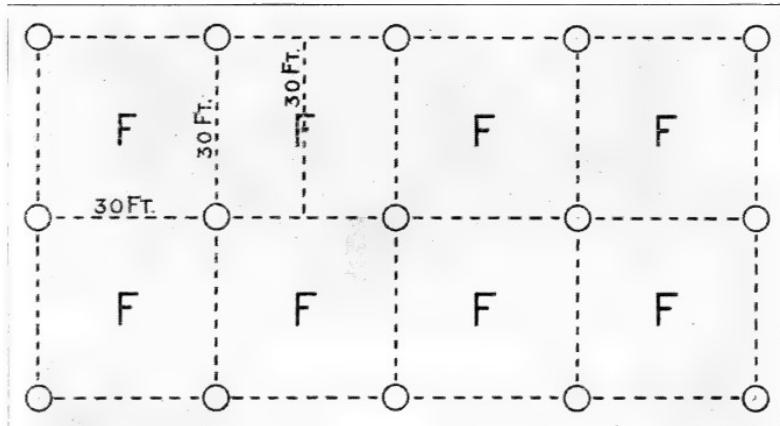
Preparing the Land

The best preparation of land for planting trees is to plow under a heavy coating of manure the fall before planting. Plow deeply, but do not turn up much of the sub-soil. If the soil seems to need further treatment at planting time, a good, thorough discing will probably be sufficient. The ground should be prepared just as well as for a farm crop.

Planting Plans

The question of planting plans must be determined by the grower. We give the merits and the faults of the two main plans as we have found them.

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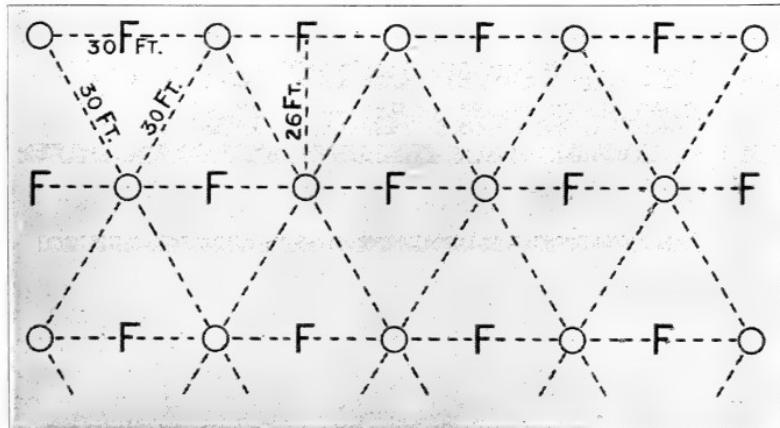


SQUARE PLAN

Circles indicate position of permanent trees and "F" indicates filler trees.

These plans are: *first*, the square plan; *second*, the triangular (also called hexagonal) plan.

The square plan has been used largely in the past. Its advantages are: *first*, easy to lay out; *second*, well adapted to the use of fillers; *third*, ease of cultivation. Its main disadvantage is, that it is not an economical use of ground (15% more trees can be planted by triangular plan than by square plan). Where fillers are used, the square plan is simpler. Plant fillers in center of each square. (See above diagram.) In this way you have the same number of fillers as permanents.



TRIANGULAR (OR HEXAGONAL) PLAN

Trees same distance apart but rows closer together — thus allowing for 15% more trees per acre than old square plan. "F" indicates position of filler trees, and circle indicates permanent trees. See following page.

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The "triangular plan," which is being largely used by commercial planters, and allows more trees to the acre than by the square plan, is explained by diagram, page 11. In the middle row the trees are opposite the spaces of the adjacent rows. Thus there is no unused space in the center as there is in the square plan. The main advantage of the triangular method is economy of land. Also, it permits cultivation or irrigation in three directions. Uses same number of fillers as permanents, but the fillers are closer to permanents, and will crowd more quickly than in the square method. We advise the use of the triangular plan.

The following table will give number of trees per acre when set at different distances:

PLANTING DISTANCE	NUMBER OF TREES TO THE ACRE	
	SQUARE PLAN	TRIANGULAR PLAN
33 ft. apart	40	46
30 "	49	56
27 "	60	69
24 "	76	88
22 "	90	104
20 "	109	125
18 "	135	155
15 "	194	223
12 "	303	349
10 "	436	502
8 "	681	783
6 "	1210	1392
5 "	1743	2005
4 "	2725	3134

Distance Apart

Planting distance will vary in different localities and under different climatic and soil conditions. Some varieties should be planted closer than others. Orchards on very strong soil should be slightly farther apart than on medium soil. If the orchardist wishes to set trees closer than we advise, he can do so, if he will keep trees well pruned in.

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Proper distances to plant are as follows:

Apple: 24 to 33 ft. apart. We advise 30 ft. as being the most satisfactory.

Apricot: 16 to 20 ft. apart.

Asparagus: 1 to 2 ft. between plants, in rows 3 to $3\frac{1}{2}$ ft. apart.

Blackberries: 3 to 4 ft. between plants, in rows 6 to 8 ft. apart.

Cherry: (Sour sorts) 16 to 20 ft. apart.

Cherry: (Sweet sorts) 20 to 27 ft. apart.

Currant: 4 ft. between plants, in rows 5 ft. apart.

Gooseberries: 4 ft. between plants, in rows 5 ft. apart.

Grape: 8 to 10 ft. apart, or 8 ft. apart in row, with rows 10 to 12 ft. apart.

Hedge Plants: 1 to 2 ft. apart. (To get a thick hedge quickly, plant two rows 10 inches apart, with plants alternating — that is, no two plants opposite.)

Mulberries: 22 to 28 ft. apart.

Pecan: 35 to 40 ft. apart.

Peach: 16 to 20 ft. apart.

Pear, STANDARD: 20 to 27 ft. apart.

Pear, DWARF: 10 to 16 ft. apart.

Plum: 15 to 20 ft. apart. (On rich soil Japanese sorts should be planted at least 20 ft. apart.)

Quince: 10 to 16 ft. apart.

Raspberries: (Black) 3 ft. between plants, in rows 6 to 8 ft. apart.

Raspberries: (Red) 3 ft. between plants, in rows 5 to 6 ft. apart.

Rhubarb: 3 ft. between plants, in rows 4 ft. apart.

Roses: 2 to $2\frac{1}{2}$ ft. apart.

Walnut: 35 to 40 ft. apart.

Pollination

Do not plant solid blocks of a single variety. In order to assure cross-pollination of the blossoms, do not plant more than five rows of any one variety in a solid block — that is, plant five rows of one variety, then five rows of another variety, etc. (For full details on pollination see page 31.)

For commercial orchards, we advise that only three or four varieties be planted in a single orchard.

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WELL CULTIVATED ORCHARD

The low, spreading heads lessen the cost of pruning, spraying, thinning and picking. Note intercropping between rows.

Fillers

The practice of planting fillers in the orchard is strongly advised by leading authorities and practical orchardists. The profits from the fillers will very often pay for the orchard before it is necessary to remove the fillers. The use of fillers allows the orchardist to get quick returns, and will furnish working capital to care for the orchard until the permanent trees come into bearing. Also the high price of land in certain sections makes the grower consider how he can get the greatest profits from a small acreage. (See diagram, page 11. F. indicates position of filler.)

The only objection to the use of fillers is that many growers will not cut them out in time. They must be removed *before they begin to crowd* the permanent trees. Young bearing varieties of apples are especially advised as fillers. This does *not* mean that they are short-lived, because they are *equally as good* when used as permanent trees. Varieties recommended for fillers:

Stark King David (one of the best), Wealthy, Liveland Raspberry, Wilson Red June, Summer Champion, McIntosh Red, Rome Beauty, Grimes Golden, Jonathan, Wagener.

Cherries also make excellent fillers. They are hardy and bear very young, are always in demand on the market and produce big profits. Varieties which grow medium size in tree, such as Moremorency and Dyehouse, are well adapted for fillers.

Many large commercial growers pay for their apple orchards by growing peach fillers. The peaches begin to bear very early, and are ready to remove before they crowd the apples.

"I have nearly 300 acres of apple orchards that have only been made possible by growing peaches as fillers and making the peaches pay the bills for developing the orchards."—J. H. Hale, the well-known peach grower of Georgia and Connecticut.

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Intercropping

Intercropping young orchards with small fruits is recommended. Currants, gooseberries, raspberries, blackberries are all excellent for this purpose. These can be grown in between the rows even when fillers are used. Other cultivated crops, such as potatoes, can also be grown.

Do not grow in the orchard crops like timothy or grain. They will rob the soil of plant foods, and will return nothing to it; also they use up large quantities of moisture.

Crops, such as clover, cowpeas, vetch and rye, are very beneficial when grown in the orchard as cover crops and plowed under. (See page 26.)

Laying Out the Orchard

The rows should be straight and correctly spaced, not only on account of the appearance, but to make the orchard operations easier. There are numerous ways of laying out the orchard, and the planter will have to determine the one best adapted and most practical for his conditions.

In planting by the *square plan*, the ends and sides of the field are staked off at intervals equal to distance between trees. Then deep furrows should be plowed from stakes on one end to corresponding stakes on the other end. Then plow furrows across the field between corresponding stakes on the sides. Wherever the furrows intersect is the position for a tree. This saves time by helping to dig the holes. To assist the man with the plow, stakes should be set in line between the end stakes. By sighting along these stakes the line can be kept fairly straight.

Another method especially applicable to small orchards is the wire method. Stakes are set on opposite ends of the field at intervals equal to distance between rows, beginning at the desired distance from the fence, usually 15 to 20 feet. Then a wire is stretched across the field between corresponding stakes. The wire should be marked at intervals equal to distance between trees. Set stakes at point indicated by the markers. After staking one row, move to the next, and so on.

In setting trees by the *triangular plan* stake the ends of the field at intervals equal to distance between rows, which will be less than the distance between trees — see diagram, page 11, for explanation. See following table for approximate distances. For example, when trees are 30 feet apart, the rows will be 26 feet wide.

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Distance Between Rows in Triangular Plan

DISTANCE BETWEEN TREES	DISTANCE BETWEEN ROWS
33 feet corresponds to....	28 feet 7 inches
30 "	26 "
27 "	23 " 3 "
24 "	20 " 9 "
22 "	19 "
20 "	17 " 4 "
18 "	15 " 8 "
15 "	13 "

Lay off the rows with a plow, or use a wire. After staking the first row, measure along the row half the distance between the first and second stakes. Mark this point and place a stake in the *second* row *exactly opposite*. This is the position for the first tree of the second row. Then stake the rest of the row at the required intervals. The third row and all odd numbered rows will correspond to the first row; all even numbered rows will correspond to the second row.

Digging the Holes

The land should be well loosened and smooth on the surface. Dig the holes large enough to receive the roots easily, without crowding or bending. In digging the holes keep the top soil separate from the bottom soil.

Dynamiting

Dynamiting land before planting is a much discussed subject. In deep, loose soils it is not necessary, but where the soil is a heavy clay or underlaid with hard-pan, dynamiting will be a great benefit. Do not dynamite when the soil is wet. Dynamiting the holes loosens the soil and will give the young roots a greater feeding area.

Distributing Trees

When distributing the trees in field keep the roots protected from drying by covering with wet cloth, or packing. One good method which has been used with excellent success is the following: place a large tank or barrel on a wagon, put in the trees with enough water or very thin mud in the bottom to protect roots from drying. The man driving can trim the roots and hand to the planters.

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Pruning the Roots

Root pruning is an essential to best results in planting trees. This consists in trimming off the broken and bruised ends. Any long, slender roots should be cut back to about 8 inches. Make a slanting cut with a sharp knife, cutting from the under side so the cut surface will rest against the soil. Cut off the ends of any bruised roots and trim off any dry, fibrous roots. A careful pruning of the root prevents "root rot," a disease responsible for the loss of many young trees in certain sections of the South.

Placing the Trees

In places where there are strong winds, orchardists follow the practice of leaning the tree slightly toward the direction of the prevailing wind. Leaning the tree toward the Southwest enables it to stand up against the wind and protects it from sunscald. However, it is probably not necessary to lean the tree if the heavy side is planted toward the wind. To determine the heavy side of a tree, balance in the hand and the side which settles next the hand is the heavy side. Plant the heavy side toward the prevailing wind.

In planting, one man should hold the tree in position, firming the dirt which the other man throws in the hole. Plant the tree an inch deeper than in the nursery row. The dark ring on the base of trunk shows the depth the tree stood in the nursery. If the soil is one which dries out quickly, plant 2 inches deeper. Dwarf pear, however, should be planted 5 to 6 inches deeper than they stood in the nursery.

Never crowd or bend the roots. Firming the dirt around the roots is of great importance. Lack of firming is largely responsible for the failure of many trees to live. Holding the tree in position, throw in some of the best top soil and work in well around the roots. Leave no air pockets. *Tramp and pound the soil in hard* until the hole is three quarters full. At this point, if the soil is very dry, it will be beneficial to add several gallons of water. Let the water sink in, and then fill up the hole with loose dirt, but do not tramp after watering. Be sure that the top 2 or 3 inches of the soil consists of *loose, untramped* soil, which will serve as a mulch and prevent excess evaporation. Some growers place well-rotted manure around the base of the tree after planting. This acts as a mulch, and also furnishes plant food for the tree. Do not place manure in direct contact with the trunk and never put it in the hole because it will make air pockets and cause the roots to dry out.

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Pruning

Do not neglect pruning — it is absolutely essential. Prune trees while young and later treatment will be much simpler. Pruning tends to increase vigor and fruitfulness; it allows sunlight to get in to the tree, giving better color to the fruit. Spraying, picking, cultivation and other orchard operations are made easier by intelligent pruning.

Time to Prune

Ordinarily, the best time to prune is in the late winter or early spring before buds swell. Pruning at this time tends to increase vigor of tree and promote wood growth. Do not prune too severely — it will cause water sprouts to develop and will check the formation of fruit buds.

Summer Pruning

Summer pruning is often resorted to when the tree is making too heavy a wood growth at the expense of fruitfulness. A moderate pruning at the height of the growing season (in June or July, depending on the season and latitude) checks the wood growth and causes the tree to throw its strength toward the formation of fruit buds.

Do not overdo summer pruning. Remove only a small amount of terminal growth, just enough to check it. In many cases, pinching back the terminal buds will be sufficient. Intelligent pruning will cause fruit spurs to form along the limbs instead of only at the ends of the branches and the tree will be able to carry a much heavier load without breaking its branches.

Height of Head

Aim to produce a well balanced tree with a low head. A low-headed tree is much easier to pick, spray, prune and thin than a higher-headed tree. Commercial planters realize the advantages of low heads and practically *all trees* planted now are *being headed low*. The main argument used in the past against a low-headed tree was that it interfered with cultivation. However, the height of head has very little to do with this. By correct pruning a tree can be made to grow sufficiently upright to permit thorough cultivation. To make a tree grow upright, prune to a bud or limb which *points upward*. The up-to-date orchard cultivators permit close cultivation without injury to the limbs.

Prof. F. A. Waugh, in "The American Apple Orchard," says: "General horticultural opinion has undergone a great change in recent years. It has been a change favorable to lower heads. Low heads tend to prevent sunscald, in fact, nearly all the disorders to which tree trunks are liable, such as borers, frost cracks, etc."

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PRUNING ONE-YEAR OLD APPLE OR PEAR

A sloping cut is made just above a strong bud. See directions, page 20.

Type of Head

There are two types used in the formation of the top of the orchard tree: *First*, the leader (pyramidal) type, which gives a high tree with one central leader and many side branches. This type has been largely used in the past but is being rapidly displaced by the open head type. *Second*, the open (vase-shaped) head, in which the leader is removed, and the remaining branches form a spreading tree with an open head. As a rule the open head is better. The breaking of any one branch does not cause the loss of the whole tree. Also the open, spreading head facilitates picking, spraying,

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and other orchard operations. However, some few varieties produce a better shaped tree if the leader is left. Whatever system you use, be sure to keep the head of the tree thinned out so as to admit the air and sunlight.

Pruning at Planting Time

Prune the top of the young tree as soon as planted — not before. Many of the roots were cut off when the tree was dug and an equal proportion of the top should be removed. (This does not apply to cherry, which requires very little pruning.) When pruning, bear in mind that the various kinds of fruit trees have different habits of growth. The different varieties of any one fruit also vary largely. For instance, a Winesap is a very spreading, willowy grower, and should be pruned so as to encourage upright growth. On the other hand, the Northern Spy is very upright, and should be headed back to make it spread out.

Making the Cut

Use a sharp knife and make a smooth, slightly slanting cut. When pruning, do not leave a snag but cut as closely as possible without injuring the trunk or limb. In cutting back, cut to a bud or branch which *points in direction desired*. Any large wounds should be painted with white lead paint, mixed with pure, *raw* linseed oil. This will keep out all disease until the wound is healed.

Pruning Apple

The *one-year apple* tree usually comes from the nursery as a single whip. Head back to a height of 18 to 30 inches, depending on height of head desired. The cut should be made slightly sloping and just above a strong bud. During the following season pinch off all buds except those selected for forming the head — four to six buds should be left. These should be on the upper 12 inches and equally distributed around the trunk so that no weak crotches will be formed. The second spring, before growth starts, head back the branches one-third to one-half of the previous season's growth. During the summer, laterals will grow on the main branches. Select several of these laterals on each branch and pinch back the others, leaving stubs 2 or 3 inches long. These stubs will develop into fruit spurs, and will bear fruit along the main branches, thus allowing the tree to carry a heavier crop.

This same general system can be followed for the first four or five years — cutting back each year a third to a half of the previous season's growth. At the end of this time the tree will be properly trained, and future trimming will be greatly simplified.

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PRUNING TWO-YEAR-OLD APPLE OR PEAR

Tree is pruned to the open head type. End buds on each limb point outwards — thus producing a spreading tree.

In pruning *two-year apple* choose four to six branches and remove all others. Head back these branches to 6 or 12 inches, making the cut just above a sound bud which points in the desired direction. The later pruning is identical with that described under *one-year apple*.

In pruning bearing trees, remember the following points: cut out all dead wood and water sprouts; where two limbs interfere, remove one of them; keep the center of the tree thinned out to admit air and sunlight; head in the terminal growth and keep the head low; *prune every year*.

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Pruning Pear

The remarks under apple pruning will apply in a general way to the pear. The open or vase-shaped tree is preferable for the pear, because there is less danger from blight. If pear blight attacks an open-headed tree, only one branch is affected, but if it attacks a tree of the single-leader type, the whole tree becomes affected. Avoid heavy pruning of the pear, for this will cause quick, succulent growth, and make the tree more subject to blight. If the pruning causes an excessive number of water sprouts to form, they should be thinned out in the summer. The young trees of certain varieties tend to drop their fruit after it is "set." Severe winter pruning will greatly counteract this tendency.

Dwarf pear are generally pruned to the main leader (pyramidal) type.

Pruning Peach

The one-year peach tree is the only satisfactory age of tree to plant. Prune to the open-headed tree. Remove the leader, heading in to 20 to 30 inches, and choose 3 to 6 branches for the framework of the tree, removing all other branches. Cut back these branches to stubs with 1 or 2 strong buds. The peach is a vigorous grower, and should be pruned severely. Head in heavily for the first 3 or 4 years, removing about one-half of the previous season's growth. After several years of this severe pruning, the result will be a shapely, low-headed tree. Prune every year, and keep the head well open, allowing the sun and air to enter. This will give the fruit better color and lessen the amount of brown rot. Remember that the fruit is borne on the previous season's growth, and if allowed to go unpruned for several years the bearing wood gets too high above ground. This fruiting habit necessitates a yearly heading in. Thinning of fruit is also accomplished by pruning. The best time for pruning the peach is in the early spring before the buds swell.

The method of pruning the apricot is essentially the same as the peach, but should not be so severe.

Pruning Plum

Plum pruning is similar to that of the peach. The different types of plum vary in their vigor of growth. The aim should be to produce good, strong branches and keep the tree in a vigorous growing condition. Keep heads thinned out. Some varieties of plums are vigorous growers and need heading back every season.

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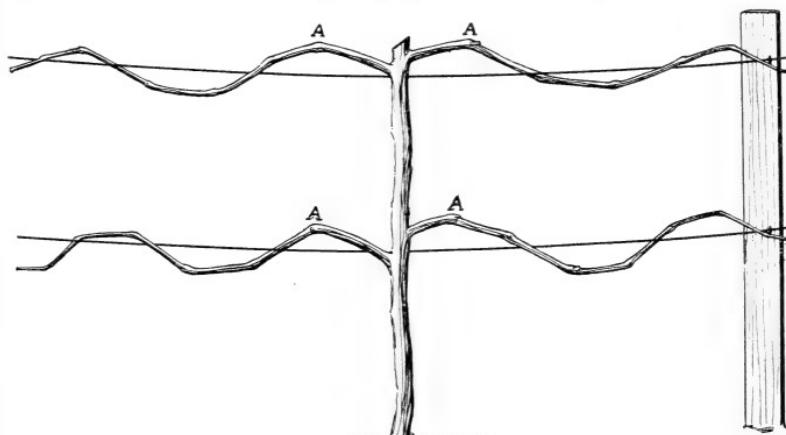
Pruning Cherry

Very little pruning is required for sour cherries. At planting time, remove broken limbs, but do not head in the branches. Keep dead wood cut out of the trees. Sweet cherry grows upright, and moderate heading back will be necessary to keep the head low.

Pruning Grape

Grapevines are vigorous growers, and must be pruned heavily every year. After planting, cut back each cane to two buds. For the first two years vines can be tied up to a temporary stake, but at beginning of third year, train on a trellis. When growing vines on an arbor, remove all canes except one which should be trained over the arbor, pinching back occasionally to cause branching.

There are many systems of pruning used in commercial vineyards. The following is one used largely in eastern grape-growing sections: after the young vine has grown a year cut off in the spring all shoots except one. Tie this firmly to a stake and head back to 4 ft. The following season, allow four canes to grow — two of them at a height of 2 ft., and the other two at a height of 4 ft. above the ground. The third spring construct the trellis, which should consist of two strong wires fastened to posts — one wire 2 ft. high and the other 4 ft. high. Double brace the posts at each end of row. Tie the upper two canes to the top wire, one cane running each way along the wire, and do the same with the lower two canes on the bottom wire. The young growth will hang down and will



GRAPEVINE AFTER PRUNING

Way it should appear third spring after planting and every year thereafter. Point "A" indicates position of bud which will produce the cane nearest the main stalk. The following spring cut back on each of the four main branches to point "A" — thus leaving main stalk and four young canes.

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bear fruit that season. The following spring (fourth season) cut off on *each* of the four main branches all of the wood *back to* the young cane *nearest* the main stalk. (Point A in diagram.) After pruning, there will be a main stalk and four one-year-old branches — two for the top wire, and two for the bottom wire. Tie up the same way as the previous season. This method of pruning should be followed each year.

Currant

The best fruit is borne on the one-year wood. If allowed to go unpruned the plants will become unproductive and the fruit will be small. After the cane has borne about three crops it should be removed. Allow several young shoots to grow each year, so they can replace the old canes. In the spring, make a judicious thinning out of old wood and superfluous young wood.

Gooseberry

Pruning is similar to the currant. Requires little pruning for the first few years, except moderate heading in of vigorous shoots in order to encourage the growth of fruit spurs. The gooseberry tends to become a dense, tangled bush and all the old weak wood should be cut out.

Black Raspberry

After the fruit has been picked remove the old canes, as each cane bears only one crop of fruit. Also if the young canes are too thick, thin out the weaker ones. The young shoots require summer pinching when about $1\frac{1}{2}$ ft. high. Pinching out the young tips will force them to branch. In the spring, before growth starts, cut back the canes to a height of 2 or 3 ft.

Purple varieties require same treatment as the black raspberry.

Red Raspberry

Red raspberry is pruned like the black raspberry, except that the young shoots should not be pinched back during their first season of growth. The canes of the red raspberry do not come from a single crown, but grow and spread from roots.

Blackberry

Like the red raspberry, the blackberry grows and spreads from the roots. It is pruned in the same way as the black raspberry, the young shoots being pinched back during their first summer's growth.

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Roses

Roses should be pruned heavily in early spring before growth starts. Slow growing plants should be pruned severely; vigorous plants only moderately. Roses which bloom during a long season should have the blossoms removed just as soon as the petals fall. This will make them bloom larger and oftener.

The hardier varieties of roses can be planted in the fall, tender ones in the spring. Roses thrive best in loose, rich soil. A coating of well-rotted manure applied to the ground and well worked in is very beneficial. Plant roses 2 to $2\frac{1}{2}$ ft. apart, depending on the vigor of the plant. The soil should be in a moist condition when planting. Press dirt firmly about roots. If planted in fall, cut back top to about 12 inches, and mound up loose dirt around plant — covering over the top with straw. In spring rake away the straw and dirt; then cut back, leaving three or four sound buds on each cane.

Shade Trees, Shrubs, etc.

Keep the dead wood cut out of the shade trees, and paint any large wounds. Generally, shade trees will do best if allowed to grow naturally. Shrubs should be headed in for the first few years after planting in order to get a dense, stocky growth. Keep all dead wood cut out.

Orchard Cultivation

Practical experience has shown that orchards should be cultivated. Tillage keeps the soil in good, loose condition and increases its water-holding capacity. Frequent shallow cultivations keep the top 2 or 3 inches of soil loosened — maintaining a dust mulch which acts like a blanket in preventing evaporation of the soil moisture. The plant foods are made available by cultivation, and manure gives better results when used on tilled land.

Young orchards, as well as old orchards, need cultivation. In a young orchard, crops, such as currants, gooseberries, etc., may be grown between the rows, but never closer to the tree than 5 feet. The cultivation of the crop will generally be sufficient for the trees. Never grow such crops as hay or grain. They rob the soil of large quantities of moisture and plant food without giving anything in return. Cover crops, such as clover, vetch, cowpeas, etc., are very desirable to grow between the tree rows. (For details on Cover Crops, see page 26.)

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MODEL ORCHARD

Constant cultivation holds moisture in the soil and protects trees from drought injury.

The number of cultivations during a season depends somewhat on local conditions of soil, climate, age of tree, etc. Young, vigorous growing trees should not be cultivated or irrigated as late in the season as bearing trees, because they will grow late and the immature growth will be very liable to winter injury.

A good plan of cultivation used by many successful orchardists is as follows: plow in the spring (not deep enough to injure the roots) as soon as the soil is in good condition. Turn the soil toward the trees the first year and away from them the next year. Various instruments can be used for later cultivations, but the aim should be to maintain a dust mulch. Cultivate after every rain as soon as possible. If the crust is not broken, a large loss of moisture will result. Cultivate the orchard every week or ten days, depending on conditions. Stop cultivation on young trees latter part of July, or earlier in some sections. This will give the new growth time to ripen before the severe weather. Older trees may be cultivated later. At the last cultivation, sow cover crops, and a good ground cover will result before winter. The next spring plow under the cover crop. Clover may remain on the ground for a year and be plowed under the following spring.

Cover Crops

Often soils get "burnt out," due to lack of organic matter. The way to add organic matter is to plow under a heavy coating of manure or cover crops. The organic matter is in the soil in the shape of humus. (See page 9.) The maintenance of humus in orchards is one of the biggest problems confronting the fruit grower. Cover crops solve the problem very effectively. The cover crop (also called green manure) is sown in the middle of summer or early fall and grows until the following spring, when it is plowed under. Some of the advantages of a cover crop are as follows:

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checks the growth of the tree and allows young wood to mature before winter; prevents winter washing of the soil with its loss of soil fertility; makes the land easier to cultivate; prevents root injury from excessive freezing; tends to delay growth of the young trees in spring until after the killing frosts; and, most important of all, it adds plant foods to the soil.

There are two classes of cover crops: *first*, leguminous, those which take the free nitrogen from the air; *second*, non-leguminous, those which can use only the nitrogen already in the soil.

Leguminous cover crops include the clovers, cowpeas, vetch, soy beans, field peas, etc. The nitrogen is taken from the air by bacteria which live on the roots. These bacteria form on the roots little knots or nodules which consist mainly of nitrogen compounds. This class of cover crops is excellent for *building up poor land*. In the Northern States, clovers, vetch, field peas, and soy beans are largely used. The cowpea is one of the best for the South, but is not satisfactory in the North. The clovers are excellent, and thrive over a large territory.

Non-leguminous cover crops include rye, buckwheat, barley, cow horn turnips, rape, etc. These plants do not use the free nitrogen of the air. In certain cases it is desirable not to add too much nitrogen for fear the growth of the trees will be too vigorous. This is especially true of pear trees where the vigorous, succulent growth is susceptible to pear blight. Buckwheat loosens up the soil well, and grows on very poor land, but kills down in winter. Rye thrives well on nearly all soils and is hardy. It should be plowed under in the spring before it grows too rank.

Combinations of different crops will give the best results. Some good combinations are: 1, hairy vetch and rye; 2, buckwheat and clover; 3, rye and buckwheat (when large amounts of nitrogen are not desired).

Amounts to Use Per Acre:

Mammoth Clover.....	15 to 20 lbs.
Crimson Clover.....	15 to 20 lbs.
Red Clover.....	10 to 15 lbs.
Cowpeas.....	1½ to 2 bu.
Vetch.....	1 to 1½ bu.
Soy Beans.....	½ to 1 bu.
Buckwheat.....	1 bu.
Rye.....	1½ to 2 bu.
Barley.....	1½ to 2 bu.
Turnips.....	4 lbs.
Rape.....	2 to 5 lbs.

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Fertilizers

During the last few years there has been much discussion on the subject of commercial fertilizers. Under certain circumstances high grade fertilizers are no doubt of great benefit to orchards, but they have often been used when full value was not received.

We quote Prof. L. L. Van Slyke, of the N. Y. Agr. Exp. Station:

"Recent experiments have shown that on fertile soils, especially of the heavier types, the use of fertilizers, continued for years even in large amounts, *does not show any appreciable effects*, whether in the case of old orchards or young ones, *provided cover crops*, including leguminous, are used, and *up-to-date methods of tillage* practiced. As a general rule, as long as trees continue to make satisfactory growth of wood and produce average crops of good, well colored fruit, no commercial fertilizer need be supplied."

The fertilizer needs must be determined largely by the orchardist. Try different fertilizers on a small scale, and in this way you can correctly determine your fertilizer needs. The high grade fertilizers are the cheapest, considering the amount of real plant food they contain.

There are ten elements essential to plant growth, and in most soils they are present in sufficient quantities for the needs of the tree. However, the three elements which may possibly be lacking are nitrogen, phosphate, and potash.

Nitrogen may be supplied by cover crops, manure, dried blood, nitrate of soda, etc. The cheapest and most satisfactory method to supply nitrogen is to grow cover crops (especially the legumes) or to apply manure.

Phosphate can be furnished in the form of acid phosphate, bone meal, ground phosphate rock, etc. Ground phosphate rock should never be applied on soils lacking in organic matter. Three hundred to five hundred pounds of rock phosphate per acre plowed under with a cover crop, or mixed with manure and then applied, is one of the most economical ways to supply phosphate when you wish to add only that element.

Potash may be applied in the form of wood ashes (which also contains a large per cent of lime). If available, use wood ashes. Muriate of potash (80% grade) is cheaper than the low grade "Kainit" (12% grade) considering the actual plant food they contain.

A *complete fertilizer* contains all three elements. The three figures, by which they are called, refer to the percentages of the three elements. For example, in a 4-9-10 guarantee, the 4 refers to 4% nitrogen, the 9 to 9% phosphate, and the 10 to 10% potash.

The value of a fertilizer depends on the pounds of *actual plant food* and the *grade* of the material. In applying fertilizer be sure that it is *well worked in to the soil* by cultivation.

Spraying

To grow clean, first-class fruit, spraying is absolutely necessary. It has become as much an essential orchard operation as pruning, cultivation, etc. Spraying is insurance. It saves the crop this year, and keeps the tree healthy so it can bear a good crop next year. *Spray thoroughly.* Careless, inefficient spraying is worthless — study the insects and diseases and know what you are spraying for.

Write your State Experiment Station for directions, or our Special Service Department will be glad to assist you.

Irrigation

"In districts with less than 20 inches of rainfall, irrigation can become a great help, and in many cases is a necessity. In irrigation, the problem is to see how little water to use instead of how much. Irrigation must go hand in hand with cultivation. Under most conditions about two irrigations during the growing season are ample where the ground is thoroughly moistened, and followed by intensive cultivation. Avoid using large amounts of water near the time of harvesting."—Prof. C. I. Lewis, Ore. Agr. Exp. Sta.

Orchard Heating

Frosts do their main damage in the spring at blooming time and sometimes cause a total loss of the crop. Frost is worse in valleys or pockets than on slopes where there is sufficient air drainage. On still, clear, cold nights there is the greatest danger from frosts.

In the western fruit growing regions orchard heating is one of the recognized practices. It often means the difference between a full crop and a total failure. Smudges of damp straw, leaves, etc., which produce a heavy, dense smoke are often used. Manufactured orchard heaters are replacing the smudges to a large extent. These are sheet iron receptacles that burn coal or oil. If you heat your orchard, *do it thoroughly.* Have everything in readiness for *immediate action*, for frosts usually come on short notice.

Thinning Fruit

Thinning is one of the most profitable orchard operations. Practical orchardists have given thinning a thorough trial, and have found it pays — *decidedly*. The annual pruning helps to thin the fruit. Many growers prefer to delay the hand thinning until after the so-called "June drop."

Some fruit growers object to the extra expense of thinning. However, it does not cost much more to pick the surplus fruit early in the season than in October at picking time. The extra profit from well thinned fruit will easily overcome the added expense.

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Thinning improves the size and color of the fruit, producing a greatly increased percentage of No. 1 fruit; also, thinning tends to eliminate the alternate bearing habit of trees. Some trees bear heavily one year and the following year do not bear at all. By thinning the crop one year, the tree can recover and be in condition to bear a crop the following year.

First, remove all wormy or defective fruit, then thin out the clusters. *Do not injure the buds or fruit spurs* for they are to bear the next year's crop. Young trees should not be allowed to bear heavy crops because the shock of overcropping will give the tree a setback. No specific rule can be given for thinning the various fruits. Some varieties require more thinning than others.

Thinning peaches is necessary to produce first-class fruit. Four to six inches between the fruit is the distance we advise. In thinning apples, shears may be used instead of removing by hand.

Picking and Packing

Picking fruit must be done carefully because the keeping qualities are largely dependent upon it. One indication of the proper time for picking most kinds of fruit is to lift them up gently and give a slight twist; if fruit comes off the spur easily, it is ready to pick. *Do not bruise the fruit or break the stems.* As soon as picked, carry to the sorting table, where it should be *carefully* graded. Pack the fruit in barrels or boxes. *Never allow it to remain in piles in the orchard.* The box pack is rapidly coming into favor, but only the best grades should be packed in boxes.

Pears should be picked while still hard and just as soon as the seeds turn brown. Allow them to ripen in a cool, dark place. If possible, wrap pears separately in paper when shipped.

Marketing

When growers plant *high quality varieties* and give their orchards *careful attention*, they will produce fruit which will find a ready market. The buyers will hunt the fruit, and will be willing to pay good prices. Work up a reputation for your fruit by having it graded and packed carefully. As soon as the buyers get confidence in your pack, they will be anxious to get your fruit.

Keep in touch with market conditions and write to different buyers, telling them all about your fruit — if necessary, send them

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a sample. Look into the financial standing of the buyer and when you sell your apples, have all details *definitely* understood.

Many growers who pack their fruit well and are in touch with market conditions, hold their fruit in cold storage until they get the advantage of the high prices late in the season.

"If you have a nice lot of Jonathans, Stark Delicious, Grimes, or other fancy varieties, do not sell them separate from your Ben Davis, or other slower selling apples. Of course, sometimes a buyer may offer such a good price for the fancy varieties that it will pay to sell them and dispose of the balance some other way."—A. P. Boles, Sec. of Mo. State Board of Horticulture.

Our Special Service Department has lists of buyers of fruit, and will be glad to furnish them to orchardists free of charge. We will help to put you in touch with buyers so that you can dispose of your fruit to best advantage.

Pollination

Certain varieties, when grown in isolated blocks, will not bear crops. This is usually due to the blossoms being self-sterile—that is, the pollen, which is the yellow dust in the blossom, will not pollinate its own blossom. If the blossom is not pollinated the fruit will not "set."

A self-fertile variety is one whose pollen will pollinate its own blossom. Self-sterility is a characteristic of certain varieties, but it varies in different sections and under different conditions. A variety may be self-sterile in the North, but in the South it may be self-fertile. This is true of Kieffer.

It has been proven that cross-pollination of one variety with another gives better results than when the blossom is pollinated by its own pollen. Cross-pollination makes the fruit larger, more uniform, and causes a larger crop to set. The fact that a variety is self-sterile does not mean that its pollen cannot fertilize a blossom of another variety. Two self-sterile varieties will usually pollinate each other if they bloom together. Insects, especially bees, cause most of the cross-pollination when they visit the blossoms. The pollen gets on their legs, and in this way is carried from blossom to blossom. Never destroy bees, and in large orchards keep a few hives in the orchard.

Never plant solid blocks of any one variety, but set out several varieties in your orchard so that cross-pollination will be certain. Do not plant more than four or five rows of a single variety together, then the same number of rows of another variety. By mixing three or four varieties in this way, pollination will be practically assured.

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Reasons for Not Bearing

Poor pollination is not the only reason some orchards fail to bear. The buds may be injured by frosts although in outward appearance they seem perfect.

Trees which are making too thrifty a growth delay fruiting. A moderate summer pruning, as described on page 18, will throw them into bearing.

Due to continued lack of care and lack of plant food, a tree may be so weakened that it can not "set" a crop. The best remedy, in such a case, is to plow the orchard and grow cover crops, turning under the following spring, or apply a heavy coating of manure.

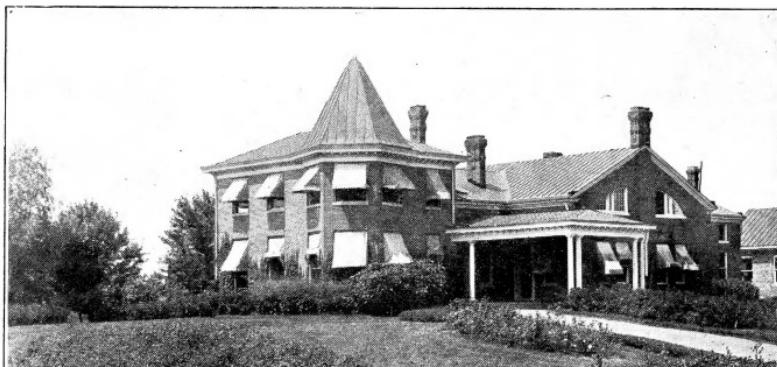
Conclusion

In the foregoing pages, we have endeavored to give practical, up-to-date knowledge on the important fruit-growing subjects.

We have quoted freely many of the leading horticultural authorities. Also much valuable data and information has been furnished by that great army of friends — the Stark Orchardists, men who have been taught by the greatest of teachers, practical experience. If you desire any special information which is not thoroughly explained in this book write to our Special Service Department.

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